

## **AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

- 1           1. (Original) A method for dynamically adjusting the aggressiveness of an  
2       execute-ahead processor, comprising:  
3           executing instructions in an execute-ahead mode, wherein instructions that  
4       cannot be executed because of an unresolved data dependency are deferred, and  
5       other non-deferred instructions are executed in program order, and wherein if a  
6       non-data-dependent stall condition is encountered, the execute-ahead processor  
7       enters a scout mode, wherein instructions are speculatively executed to prefetch  
8       future loads, but results are not committed to the architectural state of the execute-  
9       ahead processor;  
10          if an unresolved data dependency is resolved during the execute-ahead  
11       mode, executing deferred instructions in a deferred mode;  
12          wherein if some instructions are deferred again during the deferred mode,  
13       the method further comprises,  
14                  determining whether to resume execution in the execute-  
15                  ahead mode,  
16                  if it is determined to do so, resuming execution in the  
17                  execute-ahead mode, and  
18                  otherwise resuming execution in a non-aggressive mode.

- 1           2. (Original) The method of claim 1, wherein resuming execution in the  
2       non-aggressive execution mode involves remaining in the deferred mode until all

3 deferred instructions are executed and the execute-ahead processor returns to a  
4 normal execution mode.

1 3. (Original) The method of claim 1, wherein resuming execution in the  
2 non-aggressive mode involves resuming execution in a non-aggressive execute-  
3 ahead mode, wherein if a non-data-dependent stall condition is encountered, the  
4 execute-ahead processor does not enter the scout mode, but instead waits for the  
5 non-data-dependent stall condition to be resolved, or for an unresolved data  
6 dependency to return, before proceeding.

1 4. (Original) The method of claim 1, wherein prior to executing  
2 instructions in execute-ahead mode, the method further comprises entering the  
3 execute-ahead mode by:  
4 issuing instructions for execution in program order during a normal  
5 execution mode;  
6 upon encountering an unresolved data dependency during execution of an  
7 instruction,  
8 generating a checkpoint that can subsequently be used to  
9 return execution to the point of the instruction, and  
10 executing subsequent instructions in the execute-ahead  
11 mode.

1 5. (Currently amended) The method of claim 4, wherein if the launch point  
2 stall condition (the unresolved data dependency or the non-data-dependent stall  
3 condition that originally caused the execute-ahead processor to exit the normal  
4 execution mode) is finally resolved, the method further comprises using the  
5 checkpoint to resume execution in the normal execution mode from the launch

6 point instruction (the instruction that originally encountered the launch point stall  
7 condition).

1 6. (Original) The method of claim 1, wherein executing deferred  
2 instructions in the deferred mode involves:  
3 issuing deferred instructions for execution in program order;  
4 deferring execution of deferred instructions that still cannot be executed  
5 because of unresolved data dependencies; and  
6 executing other deferred instructions that are able to be executed in  
7 program order.

1 7. (Original) The method of claim 6, wherein if all deferred instructions  
2 are executed in the deferred mode, the method further comprises returning to a  
3 normal execution mode to resume normal program execution from the point  
4 where the execute-ahead mode left off.

1 8. (Original) The method of claim 1, wherein the unresolved data  
2 dependency can include:  
3 a use of an operand that has not returned from a preceding load miss;  
4 a use of an operand that has not returned from a preceding translation  
5 lookaside buffer (TLB) miss;  
6 a use of an operand that has not returned from a preceding full or partial  
7 read-after-write (RAW) from store buffer operation; and  
8 a use of an operand that depends on another operand that is subject to an  
9 unresolved data dependency.

1 9. (Original) The method of claim 1, wherein the non-data-dependent stall  
2 condition can include:

3           a memory barrier operation;  
4           a load buffer full condition; and  
5           a store buffer full condition.

1           10. (Original) An apparatus that dynamically adjusts the aggressiveness of  
2   an execute-ahead processor, comprising:  
3           an execution mechanism configured to execute instructions in an execute-  
4   ahead mode, wherein instructions that cannot be executed because of an  
5   unresolved data dependency are deferred, and other non-deferred instructions are  
6   executed in program order, and wherein if a non-data-dependent stall condition is  
7   encountered, the execution mechanism is configured to enter a scout mode,  
8   wherein instructions are speculatively executed to prefetch future loads, but  
9   results are not committed to the architectural state of the execute-ahead processor;  
10          wherein if an unresolved data dependency is resolved during the execute-  
11   ahead mode, the execution mechanism is configured to execute deferred  
12   instructions in a deferred mode;  
13          wherein if some instructions are deferred again during the deferred mode,  
14   the execution mechanism is configured to,  
15                  determine whether to resume execution in the execute-  
16                  ahead mode,  
17                  if it is determined to do so, to resume execution in the  
18                  execute-ahead mode, and  
19                  otherwise to resume execution in a non-aggressive mode.

1           11. (Original) The apparatus of claim 10, wherein while resuming  
2   execution in the non-aggressive execution mode, the execution mechanism is  
3   configured to remain in the deferred mode until all deferred instructions are  
4   executed and the execution mechanism returns to a normal execution mode.

1           12. (Original) The apparatus of claim 10, wherein while resuming  
2 execution in the non-aggressive execution mode, the execution mechanism is  
3 configured to resume execution in a non-aggressive execute-ahead mode, wherein  
4 if a non-data-dependent stall condition is encountered, the execution mechanism  
5 does not enter the scout mode, but instead waits for the non-data-dependent stall  
6 condition to be resolved, or for an unresolved data dependency to return, before  
7 proceeding.

1           13. (Original) The apparatus of claim 10, wherein prior to executing  
2 instructions in execute-ahead mode, the execution mechanism is configured to  
3 enter the execute-ahead mode by:  
4           issuing instructions for execution in program order during a normal  
5 execution mode;  
6           upon encountering an unresolved data dependency during execution of an  
7 instruction,  
8                       generating a checkpoint that can subsequently be used to  
9                       return execution at to the point of the instruction, and  
10                      executing subsequent instructions in the execute-ahead  
11                      mode.

1           14. (Currently amended) The apparatus of claim 13, wherein if the launch  
2 point stall condition ~~(the unresolved data dependency or the non-data-dependent~~  
3 ~~stall condition that originally caused the execution mechanism to exit the normal~~  
4 ~~execution mode)~~ is finally resolved, the execution mechanism is configured to use  
5 the checkpoint to resume execution in the normal execution mode from the launch  
6 point instruction (the instruction that originally encountered the launch point stall  
7 condition).

1           15. (Original) The apparatus of claim 10, wherein while executing  
2 deferred instructions in the deferred mode, the execution mechanism is configured  
3 to:  
4           issue deferred instructions for execution in program order;  
5           defer execution of deferred instructions that still cannot be executed  
6 because of unresolved data dependencies; and to  
7           execute other deferred instructions that are able to be executed in program  
8 order.

1           16. (Original) The apparatus of claim 15, wherein if all deferred  
2 instructions are executed in the deferred mode, the execution mechanism is  
3 configured to return to a normal execution mode to resume normal program  
4 execution from the point where the execute-ahead mode left off.

1           17. (Original) The apparatus of claim 10, wherein the unresolved data  
2 dependency can include:  
3           a use of an operand that has not returned from a preceding load miss;  
4           a use of an operand that has not returned from a preceding translation  
5 lookaside buffer (TLB) miss;  
6           a use of an operand that has not returned from a preceding full or partial  
7 read-after-write (RAW) from store buffer operation; and  
8           a use of an operand that depends on another operand that is subject to an  
9 unresolved data dependency.

1           18. (Original) The apparatus of claim 10, wherein the non-data-dependent  
2 stall condition can include:  
3           a memory barrier operation;  
4           a load buffer full condition; and

5 a store buffer full condition.

1 19. (Original) A computer system that dynamically adjusts the  
2 aggressiveness of an execute-ahead processor, comprising:  
3 an execute-ahead processor;  
4 a memory;  
5 an execution mechanism within the execute-ahead processor configured to  
6 execute instructions in an execute-ahead mode, wherein instructions that cannot  
7 be executed because of an unresolved data dependency are deferred, and other  
8 non-deferred instructions are executed in program order, and wherein if a non-  
9 data-dependent stall condition is encountered, the execution mechanism is  
10 configured to enter a scout mode, wherein instructions are speculatively executed  
11 to prefetch future loads, but results are not committed to the architectural state of  
12 the execute-ahead processor;  
13 wherein if an unresolved data dependency is resolved during the execute-  
14 ahead mode, the execution mechanism is configured to execute deferred  
15 instructions in a deferred mode;  
16 wherein if some instructions are deferred again during the deferred mode,  
17 the execution mechanism is configured to,  
18 determine whether to resume execution in the execute-  
19 ahead mode,  
20 if it is determined to do so, to resume execution in the  
21 execute-ahead mode, and  
22 otherwise to resume execution in a non-aggressive mode.

1 20. (Original) The computer system of claim 19, wherein while resuming  
2 execution in the non-aggressive execution mode, the execution mechanism is

3 configured to remain in the deferred mode until all deferred instructions are  
4 executed and the execution mechanism returns to a normal execution mode.

1 21. (Original) The computer system of claim 19, wherein while resuming  
2 execution in the non-aggressive execution mode, the execution mechanism is  
3 configured to resume execution in a non-aggressive execute-ahead mode, wherein  
4 if a non-data-dependent stall condition is encountered, the execution mechanism  
5 does not enter the scout mode, but instead waits for the non-data-dependent stall  
6 condition to be resolved, or for an unresolved data dependency to return, before  
7 proceeding.